

AMENDMENTS TO THE CLAIMS

1. (Original) A method for transferring a plurality (I) of independent optical signals
2 { S_i } through an optical channel having two ends, the method comprising the
steps of:

4 (a) generating a plurality (I) of independent pseudorandom bit sequences (PRBSs);

6 (b) modulating a preselected optical mode of the i^{th} independent optical signal S_i
according to the i^{th} independent pseudorandom bit sequence PRBS $_i$ to form an i^{th} modulated
optical signal MS $_i$, where $i = \{1, \dots, I\}$;

8 (c) combining a plurality (I) of the modulated optical signals {MS $_i$ } to form an
optical multiplex signal;

10 (d) transmitting the optical multiplex signal through the optical channel from one end
to the other end;

12 (e) modulating the preselected optical mode of the optical multiplex signal according
to the i^{th} pseudorandom bit sequence PRBS $_i$ to form an i^{th} modulated multiplex signal MMS $_i$; and

14 (f) passing the i^{th} modulated multiplex signal MMS $_i$ through a mode filter, whereby
the independent optical signal S $_i$ is recovered.

2. (Original) The method of claim 1 wherein the preselected optical mode comprises
2 an optical polarization mode.

3. (Original) The method of claim 2 wherein the optical channel comprises an
2 optical waveguide.

4. (Original) The method of claim 3 wherein the optical channel comprises a fiber
2 optical channel.

5. (Original) The method of claim 2 wherein the optical channel comprises free
2 space.

6. (Original) The method of claim 5 wherein the plurality (I) of independent PRBSs
2 are mutually orthogonal.

7. (Original) The method of claim 2 wherein the plurality (I) of independent PRBSs
2 are mutually orthogonal.

8. (Original) The method of claim 1 wherein the optical channel comprises an
2 optical waveguide.

9. (Original) The method of claim 8 wherein the plurality (I) of independent PRBSs
2 are mutually orthogonal.

10. (Original) An apparatus for transferring a plurality (I) of independent optical
2 signals $\{S_i\}$ through an optical channel having two ends, the apparatus comprising:

4 a first pseudorandom bit sequence (PRBS) generator for generating a plurality (I) of
independent PRBSs;

6 a plurality (I) of electro-optical modulators each coupled to the PRBS generator and
disposed for modulating the polarization mode of the i^{th} optical signal S_i according to the i^{th}
pseudorandom bit sequence PRBS $_i$ to form a modulated optical signal MS $_i$, where $i = \{1, \dots, I\}$;

8 an optical combiner disposed at one end of the optical channel for combining a plurality
(I) of the modulated optical signals $\{MS_i\}$ to form an optical multiplex signal for transmission
10 through the optical channel;

12 at least one electro-optical modulator coupled to the PRBS generator and disposed at the
other end of the optical channel for modulating the polarization mode of the optical multiplex
signal according to the i^{th} pseudorandom bit sequence PRBS $_i$ to form an i^{th} modulated multiplex
14 signal MMS $_i$; and

16 a polarized filter disposed at the other end of the optical channel for filtering the i^{th}
modulated multiplex signal MMS $_i$, whereby the independent optical signal S_i is recovered.

11. (Original) The apparatus of claim 10 further comprising:
2 a second PRBS generator disposed at the other end of the optical channel; and
4 correlator means for correlating the PRBSs from the second PRBS generator with the
PRBSs from the first PRBS generator.

12. (Original) The apparatus of claim 11 further comprising:
2 an optical splitter disposed at the other end of the optical channel for splitting the optical
multiplex signal to form a plurality (I) of optical multiplex signal copies {MSC_i};
4 a plurality (I) of electro-optical modulators, each coupled to the second PRBS generator
and disposed at the other end of the optical channel for modulating the polarization mode of the
6 ith multiplex optical signal copy MSC_i according to the ith pseudorandom bit sequence PRBS_i to
form a modulated multiplex signal MMS_i; and
8 a plurality (I) of polarized filters, each disposed at the other end of the optical channel
for filtering the ith modulated multiplex signal MMS_i, whereby the plurality (I) of independent
10 optical signal {S_i} are recovered.

13. (Original) The apparatus of claim 12 wherein the optical channel comprises an
2 optical waveguide.

14. (Original) The apparatus of claim 13 wherein the optical channel comprises a
2 fiber optical channel.

15. (Original) The apparatus of claim 11 wherein the optical channel included mode
2 distortion and at least one independent optical signal S_p is transmitted through the optical
channel, the apparatus further comprising:
4 distortion recovery means for recovering the optical channel mode distortion from the
independent optical signal S_p.

16. (Original) The apparatus of claim 15 wherein the optical channel comprises free
2 space.

17. (Original) The apparatus of claim 10 wherein the optical channel comprises an
2 optical waveguide.

18. (Original) The apparatus of claim 17 wherein the optical channel comprises a
2 fiber optical channel.

19. (Original) The apparatus of claim 10 wherein the optical channel comprises free
2 space.

20. (Original) The apparatus of claim 10 wherein the plurality (I) of independent
2 PRBSs are mutually orthogonal.

21. (Currently Amended) An apparatus for generating, from a plurality (I) of
2 independent optical signals $\{S_i\}$, an optical multiplex signal suitable for transmission into an
optical channel, the apparatus comprising:

4 a pseudorandom bit sequence (PRBS) generator for generating a plurality (I) of
independent PRBSs;

6 a plurality (I) of electro-optical modulators each coupled to the PRBS generator and
disposed for modulating the polarization mode of the i^{th} optical signal S_i according to the i^{th}
8 pseudorandom bit sequence PRBS $_i$ to form a modulated optical signal MS $_i$, where $i = \{1, \dots, I\}$,
10 thereby producing a plurality of mutually-orthogonal polarization-mode modulated optical
signals {MS $_i\}$; and

12 an optical combiner disposed at one end of the optical channel for combining a plurality
(I) of the modulated optical signals {MS $_i\}$ to form the optical multiplex signal for transmission
through the optical channel.

22. (Original) The apparatus of claim 21 wherein the optical channel comprises an
2 optical waveguide.

23. (Original) The apparatus of claim 22 wherein the optical channel comprises a
fiber optical channel.

24. (Original) The apparatus of claim 21 wherein the optical channel comprises free
space.

25. (Original) The apparatus of claim 21 wherein the plurality (I) of independent
2 PRBSs are mutually orthogonal.

26. (Original) An apparatus for receiving, from an optical channel, an optical
2 multiplex signal representing a plurality (I) of independent optical signals {S_i} and for
recovering therefrom an independent optical signal S_i, the apparatus comprising:

4 receiving means for accepting the optical multiplex signal from the optical channel;
a first pseudorandom bit sequence (PRBS) generator for generating a plurality (I) of
6 independent PRBSs;

8 at least one electro-optical modulator coupled to the PRBS generator for modulating the
polarization mode of the optical multiplex signal according to the ith pseudorandom bit sequence
PRBS_i to form an ith modulated multiplex signal MMS_i; and

10 a polarized filter for filtering the ith modulated multiplex signal MMS_i, whereby the
independent optical signal S_i is recovered.

27. (Original) The apparatus of claim 26 wherein a second PRBS generator is
2 disposed at the other end of the optical channel, the apparatus further comprising:

4 correlator means for correlating the PRBSs from the first PRBS generator with the
4 PRBSs from the second PRBS generator.

28. (Original) The apparatus of claim 27 further comprising:
an optical splitter for splitting the optical multiplex signal to form a plurality (I) of optical
multiplex signal copies {MSC_i};

4 a plurality (I) of electro-optical modulators, each coupled to the first PRBS generator for
modulating the polarization mode of the ith multiplex optical signal copy MSC_i according to the
6 ith pseudorandom bit sequence PRBS_i to form a modulated multiplex signal MMS_i; and

8 a plurality (I) of polarized filters for filtering the ith modulated multiplex signal MMS_i,
whereby the plurality (I) of independent optical signal {S_i} are recovered.

29. (Original) The apparatus of claim 28 wherein the optical channel comprises an
2 optical waveguide.

30. (Original) The apparatus of claim 29 wherein the optical channel comprises a
2 fiber optical channel.

31. (Original) The apparatus of claim 27 wherein the optical channel included mode
2 distortion and at least one independent optical signal S_p is transmitted through the optical
channel, the apparatus further comprising:

4 distortion recovery means disposed at the other end of the optical channel for recovering
the optical channel mode distortion from the independent optical signal S_p .

32. (Original) The apparatus of claim 31 wherein the optical channel comprises free
2 space.

33. (Original) The apparatus of claim 26 wherein the optical channel comprises an
2 optical waveguide.

34. (Original) The apparatus of claim 33 wherein the optical channel comprises a
2 fiber optical channel.

35. (Original) The apparatus of claim 26 wherein the optical channel comprises free
2 space.

36. (Original) The apparatus of claim 26 wherein the plurality (I) of independent
2 PRBSs are mutually orthogonal.